

REMARKS

Applicant respectfully requests reconsideration of this application as amended. Applicant provides the following remark in response to the final Office Action of December 23, 2003. No claims have been amended. Claims 1-7, 10-13 and 16-20 have been cancelled without prejudice. New claims 28-37 have been added. Therefore, claims 8, 9 and 21-37 are now presented for examination.

35 U.S.C. § 103 Rejection

Claims 8-9, 14-17, and 21-24 stand rejected under 35 U.S.C. §103 (a) as being anticipated by Stiles et al., U.S. Patent No. 5,515,518 ("Stiles") in view of Karp et al., U.S. Patent No. 6,321,328 ("Karp").

Stiles discloses a hybrid cache structure . . . [having a] first level BPC . . . which *caches full prediction information* for a limited number of branch instructions . . . [and the] second direct mapped level BPC . . . which *caches only partial prediction information*, but does so for a much larger number of branch instructions" (Abstract; emphasis provided). Karp discloses "*a low latency data cache for holding data accessed in the memory in response to the instructions, a low latency data buffer for holding speculative data accessed in the memory in response to the speculative load instruction*" (col. 2, lines 3-7; emphasis provided; see generally, col. 2, lines 1-55). Stiles and Karp, neither individually nor when combined, teach or reasonably suggest the combination and use of SBTB and ABTB as recited by claim 8.

In contrast, for example, claim 8, in pertinent part, recites:

A method, comprising:
speculatively allocating a first branch entry for a conditional branch in a speculative branch target buffer (SBTB) prior to execution of the conditional branch responsive to decoding the conditional branch

and finding no branch entry in an architectural branch target buffer (ABTB) corresponding to the conditional branch;
speculatively allocating a second branch entry for the conditional branch in the SBTB responsive to a subsequent failed attempt to locate a branch entry in the ABTB corresponding to the conditional branch;
allocating a third branch entry for the conditional branch in the ABTB after retirement of the conditional branch; and
subsequently performing branch prediction for the conditional branch by determining a predicted target address branch based upon branch data associated with the second branch entry.
(emphasis provided).

Claim 8 recites a combination of SBTB and ABTB to speculatively allocate a first branch in response to decoding of a conditional branch and with no branch entry in the ABTB, speculatively allocation a second branch if still failed to locate a branch entry in the ABTB, and allocating a third branch entry in the ABTB once the conditional branch as retired. For example, the combination of SBTB and ABTB allows SBTB to maintain the speculative branch data for in-flight branches (e.g., those that are fetched, but not yet retired), while ABTB is dedicated to store the architectural and actual branch data to, at least, improve the cost and performance of branch prediction. In yet another example, the SBTB allows the speculative history and the selection bit to be eliminated from ABTB (e.g., allowing ABTB to be single-ported), saving area that can be traded or used for performance. Also, for example, branches can be allocated speculatively in SBTB at the time of decode to help avoid mispredictions in tight loop branches, and the branch entry is updated speculatively at prediction time and corrected at execution time in SBTB to, for example, reduce the number of ABTB access and update traffic to ABTB (see Specification, page 7).

Stiles and Karp, neither individually nor when combined, teach or reasonably suggest, having and using the SBTB and the ABTB as recited by claim 8. Accordingly, Applicant respectfully requests the withdrawal of the rejection to claim 8 and its dependent claims.

With regard to the new independent claim 28, it includes the limitations similar to those of claim 8 and further recites, “a target address generator coupled to the SBTB cache and the ABTB cache, the target address generator to determine a predicted target address for a branch prediction based upon the speculative branch data and the architectural branch data” (emphasis provided). Neither Stiles nor Karp, individually or when combined, teach or reasonably suggest using a target address generation in combination with the SBTB and ABTB caches to determine a predicted target address for a branch prediction, as recited by claim 28. Accordingly, Applicant respectfully submits that claim 28 and its dependent claims are distinguished from the cited references.

With regard to claims 14 and 21, they contain limitations similar to those of claim 8. Accordingly, Applicant respectfully requests the withdrawal of rejection to claims 14 and 21 and their dependent claims.

With regard to claim 33, it contains limitations similar to those of claim 28. Accordingly, Applicant respectfully submits that claim 33 and its dependent claims are distinguished from the cited references.

35 U.S.C. § 103 Rejection

Claims 18-20 and 25-27 stand rejected under 35 U.S.C. §103 (a) as being anticipated by Stiles in view of Karp as applied to claims 1, 10, and 16 above, and further in view of Applicant’s admitted prior art in the Background of the Invention (“Prior Art”).

With regard to claims 18-20, they have been cancelled, without prejudice.

With regard to claim 25-27, they depend from claim 21 and thus, include the limitations of the claim 21. Accordingly, Applicant requests the withdrawal of rejection to claims 25-27.

Conclusion

Applicant submits that claims as amended are now in condition for allowance. Accordingly, Applicant respectfully requests that the rejections be withdrawn and the application be allowed.



Invitation for a Telephone Interview

The Examiner is requested to call the undersigned at (303) 740-1980 if there remains any issue with allowance of the case.

Request for an Extension of Time

Applicant respectfully petitions for an extension of time to respond to should one be necessary. Please charge our Deposit Account No. 02-2666 to cover the necessary fee under 37 C.F.R. § 1.17(a) for such an extension.

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Charge our Deposit Account

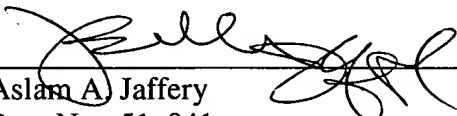
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Please charge any shortage to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: May 24, 2004


Aslam A. Jaffery
Reg. No. 51, 841

12400 Wilshire Boulevard
7th Floor
Los Angeles, California 90025-1030
(303) 740-1980